REMARKS

Applicant responds hereby to the Official Action mailed September 7, 2004, from the USPTO. A Petition for extension of time accompanies this Amendment, extending the time for response hereto up to and including January 7, 2005.

Applicant extends sincere thanks to Examiner Vu for the indication of the allowable subject matter of claim 6. Applicant, however, believes quite strongly in the patentability of his independent claims as filed, and has opted to argue the merits. Reconsideration of the patentability of the independent claims, and claim 6, which depends from 5/4/3/1.

Rejection Under 35 USC § 102

In the outstanding Office Action, claims 1, 2, 7-10 were rejected under 35 USC § 102(b) as anticipated by Lim et al., IEEE Publication ("Lim"). With respect to claims 1 and 10, the Examiner asserts that Lim includes receiving a time-varying input signal y, derives from y a plurality of spectral component signals representing respective magnitudes |Y(k)| of spectral components of Y (the FFT represented by F in Fig. 3, obtaining a correlation coefficient Ysn indicative of a correlation in the spectral domain between a clean speech signal component s and a noise signal component n present in input signal y (y+s + n); eq. 4 at 1590, last two terms on right hand side are correlation terms, and estimating magnitudes of respective noise suppressed components S^(k) by solving a correlation equation giving a relationship between the magnitudes of respective spectral components |Y(k)| of noisy signal y, of the clean speech signal s and spectral components |N(k)| of noise signal n (pages 1590-91).

Applicant respectfully disagrees.

Applicants independent claim 1 sets forth a method for reducing noise in a noisy time-varying input signal y, such as a speech signal. The method includes receiving the noisy time-varying input signal y; deriving from the input signal y a plurality of spectral component signals representing respective magnitudes $|Y(k)|$ of spectral components of the input signal y; obtaining a correlation coefficient γ_{sn} indicative of a correlation in the spectral domain between a clean speech signal component s and a noise signal component n present in the input signal y ($y = s + n$); and estimating magnitudes of respective noise-suppressed spectral components $\hat{S}(k)$ by solving a correlation equation giving a relationship between the magnitudes of the respective spectral components $|Y(k)|$ of the noisy input signal y, the spectral components $|S(k)|$ of the clean speech

signal s, and the spectral components $|N(k)|$ of the noise signal n, where the equation includes the correlation based on the obtained correlation coefficient γ_{sn}.

Applicant's independent claim 10 sets forth apparatus for reducing noise in a noisy time-varying input signal y, such as a speech signal. The apparatus includes an input for receiving the noisy time-varying input signal y, means for deriving from the input signal y a plurality of spectral component signals representing respective magnitudes $|Y(k)|$ of spectral components of the input signal y, means for obtaining a correlation coefficient γ_{sn} indicative of a correlation in the spectral domain between a clean speech signal component s and a noise signal component n present in the input signal y ($y = s + n$) and means for estimating magnitudes of respective noise-suppressed spectral components $\hat{S}(k)$ by solving a correlation equation giving a relationship between the magnitudes of the respective spectral components $|Y(k)|$ of the noisy input signal y, the spectral components $|S(k)|$ of the clean speech signal s, and the spectral components $|N(k)|$ of the noise signal n, where the equation includes the correlation based on the obtained correlation coefficient γ_{sn}.

Lim teaches speech enhancement techniques based on short-time spectral amplitude estimation. Lim's methods focus on the short-term spectral amplitude rather than phase. Equation 4 on page 1590 is utilized in Lim's power spectrum subtraction technique. Equation 4 is utilized to derive $S_w(\omega)$, the Fourier transform of the windowed speech signal $s_w(n)$. Lim estimates energy spectral densities.

Applicant respectfully disagrees with the Examiner's statement that the last two terms of the right hand side of Equation 4 represent applicant's "correlation coefficient γ_{sn} indicative of a correlation in the spectral domain between a clean speech signal component s and a noise signal component n present in the input signal y ($y = s + n$)". Lim's last two term are respectively the transform of the windowed speech signal multiplied by the complex conjugate transform of the windowed noise signal, and the complex conjugate of the transformed windowed noise signal multiplied by the transformed windowed noise signal. For that matter, Lim estimates while applicant "obtains".

Further, applicant estimates magnitudes of respective noise-suppressed spectral components $\hat{S}(k)$ by solving a correlation equation giving a relationship between the magnitudes of the respective spectral components $|Y(k)|$ of the noisy input signal y, the spectral components $|S(k)|$ of the clean speech signal s, and the spectral components $|N(k)|$ of the noise signal n, where the

equation includes the correlation based on the "obtained" correlation coefficient γ_{sn}. With all due respect, applicant has carefully studied pages 1590 and 1591, particularly with respect to any correlation terms as suggested by the Examiner, but still does not see where Lim teaches or suggests obtaining the spectral coefficient γ_{sn} and using it to estimate the magnitudes of the respective noise-suppressed spectral components as taught by applicant.

Accordingly, applicant respectfully asserts that claims 1 and 10 are patentably distinct from Lim under 35 USC § 102(e), and requests withdrawal of the rejection of the independent claims. Because claims 2 and 7-9 depend from claim1, claims 2-9 are also patentable over Lim for at least the reasons set forth in applicant's argument for the patentability of claim 1, and respectfully requests withdrawal of the rejection of claims 2 and 7-9 under Section 102(b) in view of Lim

Rejection Under 35 USC § 103

In the outstanding Office Action, claims 3-5 were rejected under 35 USC § 103(c) as unpatentable by Lim in view of US Patent No. 4,697,261 to Wang, et al. (Wang).

Applicant respectfully asserts that claim 1 is distinguishable from Lim for at least the reasons set forth above, such that dependent claims 3-5 are also readily distinguishable. Hence, even combining Lim with Wang does not render claims 3-5 obvious under 35 USC § 103(c), and respectfully requests withdrawal of the rejections of claims 3-5 thereunder.

Applicants' undersigned attorney may be reached at the number listed below and would welcome a telephone call from the Examiner to discuss the instant merits in order to further the prosecution and passage to issue of this application.

Respectfully submitted,

By ______________________

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